Docket No.: 50212-191

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PATENT & TRADEMARK OFFICE

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of	:	Customer Number: 20277
Toshiaki OKUNO, et al.	:	Confirmation Number: 2297
Application No.: 09/781,564	:	Tech Center Art Unit: 2633
Filed: February 13, 2001	:	Examiner: Dzung D. Tran

For: OPTICAL TRANSMISSION SYSTEM AND METHOD

TRANSMITTAL OF APPEAL BRIEF

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Submitted herewith in triplicate is Appellant(s) Appeal Brief in support of the Notice of Appeal filed December 29, 2004. Please charge the Appeal Brief fee of $500.00 to Deposit Account 500417.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

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APPEAL BRIEF

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This Appeal Brief is submitted in support of the Notice of Appeal filed December 29, 2004 from the rejection of claims 1-18, all of which have been twice rejected.

I. REAL PARTY IN INTEREST

The real party in interest in this application is the assignee, Sumitomo Electric Industries, Ltd.

II. RELATED APPEALS AND INTERFERENCES

Appellant is unaware of any related Appeal or Interference.

III. STATUS OF CLAIMS

Pending claims 1-18 have been twice rejected. It is from the rejection of claims 1-18 that this Appeal is taken.

IV. STATUS OF AMENDMENTS

No Amendment has been filed subsequent to the issuance of the Office Action dated September 3, 2004.

V. SUMMARY OF INVENTION

As discussed in the Summary of the Invention section of the present specification, a conventional multi-drop system, known as wavelength division multiplexing optical transmission system, is a system in which a plurality of signal light components having wavelengths different from each other are transmitted through a single optical transmission line while successively being multiplexed or demultiplexed at respective signal multiplexing or demultiplexing sections. In instances where an optical amplifier is installed on the optical transmission line of such a multi-drop type wavelength division multiplexing transmission system, a plurality of signal multiplexing sections are installed in the optical transmission line connected to the input side of the optical amplifier, whereby multiple-wavelength light including signal light components having wavelengths different from each other multiplexed at the individual signal multiplexing sections is amplified by the optical amplifier. Here, the attenuation of signal light caused by optical transmission depends on the transmission length, whereas the respective transmission lengths by which the signal light components multiplexed at their

corresponding signal multiplexing sections are transmitted until they are fed into the optical amplifier vary depending on the positions where the signal multiplexing sections are installed. As a consequence, the S/N ratio of signal light in the output of optical amplifier may vary among the individual signal light components.

The present invention addresses and solves problems and difficulties of the prior art by providing an optical transmission system and method in which fluctuations in S/N ratio among signal light components of multiple-wavelength signal light amplified by an optical amplifier on an optical transmission line are reduced.

According to one aspect of the present subject matter, as described in independent claim 1, an optical transmission system is provided which comprises (1) an optical transmission line through which a plurality of signal light components having wavelengths different from each other included in a predetermined wavelength band are transmitted; (2) an optical amplifier, installed on the optical transmission line, having a wavelength-dependent noise figure; and (3) a plurality of multiplexing stations each constituted by a signal multiplexing section installed on the optical transmission line connected to an input end side of the optical amplifier, and at least one signal light outputting means for outputting a signal light component multiplexed at the signal multiplexing section; wherein (4), between two of the multiplexing stations adjacent each other, the signal light outputting means of the multiplexing station disposed upstream in a signal light propagating direction outputs a signal light component having a signal wavelength set so as to yield a noise figure lower than that of the signal wavelength of a signal light component outputted from the signal light outputting means of the multiplexing station disposed downstream.

Also, as described in independent claim 16, the present invention provides an optical transmission method applied to an optical transmission system comprising: (1) an optical transmission line through which a plurality of signal light components having wavelengths different from each other included in a predetermined wavelength band are transmitted; (2) an optical amplifier, installed on the optical transmission line, having a wavelength-dependent noise figure; and (3) a plurality of signal multiplexing sections installed on the optical transmission line connected to an input end side of the optical amplifier; wherein (4), between two of the signal multiplexing sections adjacent each other, a signal light component having a signal wavelength with a noise figure lower than that of the signal wavelength of a signal light component multiplexed at the signal multiplexing section disposed downstream in a signal light propagating direction is selectively assigned as a signal light component multiplexed at the signal multiplexing section disposed upstream.

Taking account of the fact that the noise figure (NF) of an optical amplifier such as EDFA applied to an optical transmission system has a wavelength dependency, the present inventors have found it possible to lower fluctuations in S/N ratio according to the correlation between this wavelength dependency and the transmission length. Namely, as a signal multiplexing section is located farther from an optical amplifier, the signal light power fed into the optical amplifier becomes lower due to transmission loss. In response thereto, the respective signal wavelengths of signal light components having wavelengths different from each other multiplexed at their corresponding signal multiplexing sections in the above-mentioned optical transmission system and method are set so as to become a signal wavelength with a lower noise figure as the signal

multiplexing section is located farther (on the upstream side) from the optical amplifier.

Here, at the signal wavelength of signal light component having a lower input signal light power, the noise light occurring therefrom similarly becomes lower. Therefore, fluctuations in S/N ratio among individual signal light components can be reduced in a simple manner at a low cost without complicating the system configuration of optical transmission system and the device configuration of optical amplifier.

As described in independent claim 11, the present invention provides an optical transmission system comprising: (1) an optical transmission line through which a plurality of signal light components having wavelengths different from each other included in a predetermined wavelength band are transmitted; (2) a plurality of optical amplifiers, installed on the optical transmission line, each having a wavelength-dependent noise figure; (3) a first multiplexing station having a first signal multiplexing section installed upstream the plurality of optical amplifiers in a signal light propagating direction, and first signal light outputting means for outputting a first signal light component multiplexed at the first signal multiplexing section; (4) a second multiplexing station having a second signal multiplexing section installed between the plurality of optical amplifiers or installed upstream the plurality of optical amplifiers but downstream the first signal multiplexing section, and second signal light outputting means for outputting a second signal light component multiplexed at the second signal multiplexing section; and (5) a receiving station, installed downstream the plurality of optical amplifiers, for receiving the first signal light component having a first signal wavelength multiplexed at the first signal multiplexing section and the second signal light component having a second signal wavelength multiplexed at the second signal multiplexing section;

wherein (6) the first signal light outputting means outputs the first signal light component having the first signal wavelength set such that the noise figure between the first signal multiplexing section and the receiving station is lower than that of the second signal wavelength.

The present subject matter, as described in independent claim 17, provides for an optical transmission method applied to an optical transmission system which comprises: (1) an optical transmission line through which a plurality of signal light components having wavelengths different from each other included in a predetermined wavelength band are transmitted; (2) a plurality of optical amplifiers, installed on the optical transmission line, each having a wavelength-dependent noise figure; (3) a first signal multiplexing section, installed upstream the plurality of optical amplifiers in a signal light propagating direction, for multiplexing a first signal light component; (4) a second signal multiplexing section, installed between the plurality of optical amplifiers or installed upstream the plurality of optical amplifiers but downstream the first signal multiplexing section, for multiplexing a second signal light component; and (5) a receiving station, installed downstream the plurality of optical amplifiers, for receiving the first signal light component having a first signal wavelength multiplexed at the first signal multiplexing section and the second signal light component having a second signal wavelength multiplexed at the second signal multiplexing section; wherein (6) the first signal light component having the first signal wavelength whose noise figure between the first signal multiplexing section and the receiving station is lower than that of the second signal wavelength is selectively assigned as the signal light component multiplexed at the first signal multiplexing section.

In the case where a plurality of optical amplifiers exist between a receiving station for receiving the multiplexed signal light and a signal multiplexing section, fluctuations in S/N ratio can similarly be reduced by use of the correlation between the wavelength dependency of noise figure and the transmission length to the receiving station. In this case, as mentioned above, noise figures are compared concerning the first and second signal wavelengths at the first and second signal multiplexing sections where the signal light components received at the same receiving station are multiplexed, and the signal light components to be multiplexed are selected such that the signal wavelength with a lower noise figure is set at the signal multiplexing section on the upstream side.

This setting method is similarly applicable regardless of whether or not a plurality of optical amplifiers are partly interposed between the first and second signal multiplexing sections. Here, the noise figure between the first signal multiplexing section and the receiving station refers to the sum of the respective noise figures of the plurality of optical amplifiers installed between the first signal multiplexing section and the receiving station.

VI. ISSUES

A. The Rejections

1. Claims 1, 3, 4, 6, 8, 9, 11, 13, 14 and 16 through 18 were rejected under 35 U.S.C. § 103 for obviousness predicated upon Mitsuda et al. (U.S. Pat. No. 5,563,733, hereinafter "Mitsuda") in view of Ogoshi et al. (U.S. Pat. No. 6,028,698, hereinafter "Ogoshi"); and

2. Dependent claims 2, 5, 7, 10, 12 and 15 were rejected under 35 U.S.C. § 103 for obviousness predicated upon Mitsuda in view of Ogoshi and further in view of Shimomura et al. (U.S. Pat. No. 6,404,525, hereinafter "Shimomura").

B. The Issues Which Arise In This Appeal and Require Resolution by the Honorable Board of Patent Appeals and Interferences (the Board) are:

1. Whether claims 1, 3, 4, 6, 8, 9, 11, 13, 14 and 16 through 18 are unpatentable under 35 U.S.C. § 103(a) predicated upon Mitsuda in view of Ogoshi; and

2. Whether dependent claims 2, 5, 7, 10, 12 and 15 are unpatentable under 35 U.S.C. §103 for obviousness predicated upon Mitsuda in view of Ogoshi and further in view of Shimomura.

VII. GROUPING OF CLAIMS

The appealed claims stand together as a group. The patentability of independent claims 1, 6 and 12 (directed to an optical transmission system); and independent claim 16, 17 and 18 (directed to an optical transmission method) is advocated.

VIII. THE ARGUMENT

Issue 1 – Whether claims 1, 3, 4, 6, 8, 9, 11, 13, 14, 16, 17 and 18 are unpatentable under 35 U.S.C. § 103(a) predicated upon Mitsuda in view of Ogoshi.

The Examiner's Position

In the statement of the rejection, the Examiner asserted that Mitsuda discloses multiplexing stations comprising multiplexing sections (element 21 of Fig. 6) and a transmitter coupled with wavelength indicating device (elements 11 of Fig. 6 at 0.98/1.55 μm). Moreover, the Examiner stated that elements 31, 32 and 33 of Fig. 6 allegedly act as EDFA or optical amplifiers and that the multiplexing stations (elements 21 and 11 of Fig. 6) are installed outside of the optical amplifiers.

The Examiner admitted that Mitsuda does not disclose an optical transmission system or method wherein the first signal light component having the first signal wavelength whose noise figure between said first signal multiplexing section and said receiving section is lower than that of said second signal wavelength and is selectively assigned as the signal light component multiplexed at the first signal multiplexing section. Nevertheless, the Examiner concluded that one having ordinary skill in the art would have been motivated to modify the optical transmission system and methodology of Mitsuda by having a first signal wavelength at the first multiplexing section that has a lower noise figure than the second signal wavelength at the second multiplexing section since Ogoshi allegedly suggests that such configuration advantageously maintains the optical power output.

Appellants' Position

The initial burden of establishing a *prima facie* basis to deny patentability to a claimed invention under any statutory provision always rests upon the Examiner. *In re Mayne*, 41 USPQ2d 1451 (Fed. Cir. 1997); *In re Duel*, 34 USPQ2d 1210 (Fed. Cir. 1995); *In re Bell*, 26 USPQ2d 1529 (Fed. Cir. 1993). That burden has not been discharged.

Appellants respectfully submit that the Examiner has not properly construed the teachings of the Mitsuda reference. In view of the arguments presented *infra*, Appellants respectfully submit that in view of the clear difference between the optical fiber amplifier of the primary reference, Mitsuda, and the optical transmission system of the present claimed invention, the rejection is not sustainable.

Mitsuda discloses a configuration of the optical fiber amplifier itself, as illustrated in Fig. 6. In the optical amplifier of Mitsuda, WDM couplers are installed in the amplifier. Again, in contrast to the optical amplifier and methodology of Mitsuda, in accordance with the present invention, the multiplexing stations are installed outside of the optical amplifier, and on the ordinary optical transmission line.

Mitsuda, at col. 7, Example 3, discloses the amplifier configuration for coupling the signal light with the pump light. For example, the WDM coupler 21 shown in Fig. 6 of Mitsuda is used for coupling the first and second signals 51 and 53 with the pump light 35 from the pump laser diode 11. Note that, in Fig. 6 of Mitsuda, 51 and 53 denote signal light components, 55, 56 and 57 denote pump light components (see col. 7 line 37 – line 61), and thus, the WDM couplers 21 to 23 are all used for coupling the signals with the

pump light. Mitsuda does not disclose or suggest the multiplexing of signals 51 and 53.

In contrast with Mitsuda, in the optical transmission system of the present invention, the multiplexing stations are installed outside the optical amplifier. In this system configuration, as described in independent claims 1, 6, 11 and 16, the multiplexing station is used for multiplexing the signal light components in a predetermined wavelength band. In other words, the multiplexing station is not used for coupling the signal light with the pump light for optical amplification. As described in the present specification, the term multiplexing is understood as the simultaneous transmittance of two or more signals on a single channel. See page 11, lines 4-16 of the present specification.

Further, with Mitsuda's optical amplifier, the noise figure of the amplifier is directly adjusted. Mitsuda clearly states that as to this amplifier "... noise can be minimized by exciting the signal by the 0.98 μm pump light at an output section of the optical fiber amplifier." See col. 7 of Mitsuda, lines 60 through 66. In other words, the noise figure of the amplifier disclosed by Mitsuda is directly adjusted within the amplifier itself as apparent from a reading of column 7 of Mitsuda, lines 20 through column 8, line 4.

On the other hand, in the optical transmission system of the present invention, the noise figure of the amplifier itself is not adjusted, and fluctuations in S/N ratio are reduced according to the correlation between the wavelength dependency of the noise figure and the transmission length, as described in the written description of the specification. Such an optical transmission system and optical transmission method are neither disclosed nor suggested by the applied art. Thus, the optical transmission system

of the present invention is patentably distinct from the optical amplifier disclosed in Mitsuda. Appellants submit that the above described system configuration is neither disclosed nor suggested in Mitsuda. Accordingly, there are fundamental differences between the claimed optical transmission system and method and those disclosed by Mitsuda.

With respect to the secondary reference, Ogoshi discloses a configuration of the optical fiber amplifier itself, such as a pumping configuration, as illustrated in Fig. 1 of Ogoshi. Clearly, the optical transmission system of the present invention is completely different from that of Ogoshi. Appellants submit that the Examiner is improperly picking and choosing the elements of the prior art in an attempt to back into the present invention without the requisite "thorough and searching" factual inquiry to support the proposed combination. *In re Lee*, 237 F.3d 1338, 61 USPQ2d 1430, 1433 (Fed. Cir. 2002). The motivation must come from the prior art and not Appellants' own teaching. It is well established that hindsight reconstruction using the application as a template is improper and impermissible. *In re Gorman*, 939 F.2d 982, 18 U.S.P.Q.2d 1885 (Fed. Cir. 1991). In the instant case, the Examiner has used the same impermissible hindsight construction to achieve the present invention. Appellants, therefore, submit that the imposed rejection of claims 1, 3, 4, 6, 8, 9, 11, 13, 14 and 16 through 18 under 35 U.S.C. § 103 for obviousness predicated upon Mitsuda in view of Ogoshi is not factually or legally viable and, hence, solicit withdrawal thereof.

Issue 2 - Whether dependent claims 2, 5, 7, 10, 12 and 15 are unpatentable under 35 U.S.C. §103 for obviousness predicated upon Mitsuda in view of

Ogoshi and further in view of Shimomura.

The Examiner's Position

The Examiner's arguments with respect to claims 2, 5, 7, 10, 12 and 15, are stated on page 7 of the September 3, 2004 Office action. For the reasons outlined below, the rejection is not legally viable and should be withdrawn.

Appellant's Position

claims 2 and 5 depend from independent claim 1; claims 7 and 10 depend from independent claim 6; and claims 12 and 15 depend from independent claim 11. Appellants incorporate herein the arguments previously advanced in traversing the imposed rejection of claims 1, 6 and 11 under 35 U.S.C. § 103 for obviousness predicated upon Mitsuda in view of Ogoshi. The additional reference to Shimomura does not cure the argued deficiencies in the attempted combination of Mitsuda and Ogoshi. Indeed, Shimomura merely discloses an optical add-drop multiplex (ADM). However, Shimomura neither discloses nor suggests an optical transmission system as in the present invention. Accordingly, even if all the applied references are combined, and again Appellants do not agree that the requisite fact-based motivation has been established, the claimed inventions would not result. *Uniroyal, Inc. v. Rudkin-Wiley Corp., supra.*

Appellants, therefore, submit that the imposed rejection of claims 2, 5, 7, 10, 12 and 15 under 35 U.S.C. § 103 for obviousness predicated upon Mitsuda in view of Ogoshi and Shimomura is not factually or legally viable and, hence, solicit withdrawal thereof. Accordingly, favorable consideration is solicited.

IX. CONCLUSION

Based upon the foregoing, Appellants submit that the Examiner has not established a prima facie basis to deny patentability to the claimed inventions under 35 U.S.C. § 103 for the reasons set forth *supra.*

X. PRAYER FOR RELIEF

Based upon the arguments submitted *supra,* Appellants submit that the Examiner's rejections under 35 U.S.C. § 103 are factually and legally erroneous. Appellants, therefore, solicit the Honorable Board to reverse Examiner's rejections under 35 U.S.C. § 103.

To the extent necessary, a petition for an extension of time under 37 CFR § 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

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APPENDIX

1. (Original) An optical transmission system comprising:

an optical transmission line through which a plurality of signal light components having wavelengths different from each other included in a predetermined wavelength band are transmitted;

an optical amplifier, installed on said optical transmission line, having a wavelength-dependent noise figure; and

a plurality of multiplexing stations each constituted by a signal multiplexing section installed on said optical transmission line connected to an input end side of said optical amplifier, and at least one signal light outputting means for outputting a signal light component multiplexed at said signal multiplexing section;

wherein, between two of said multiplexing stations adjacent each other, said signal light outputting means of said multiplexing station disposed upstream in a signal light propagating direction outputs a signal light component having a signal wavelength set so as to yield a noise figure lower than that of the signal wavelength of a signal light component outputted from said signal light outputting means of said multiplexing station disposed downstream.

2. (Original) An optical transmission system according to claim 1, wherein said signal multiplexing section includes an optical ADM.

3. (Original) An optical transmission system according to claim 1, wherein said

signal multiplexing section includes a WDM coupler.

4. (Original) An optical transmission system according to claim 1, wherein said optical amplifier is an Er-doped fiber amplifier.

5. (Original) An optical transmission system according to claim 1, further comprising signal wavelength indicating means for indicating a setting of said signal wavelength for said signal light outputting means in each of said plurality of multiplexing stations according to said noise figure.

6. (Original) An optical transmission system comprising:

an optical transmission line through which a plurality of signal light components having wavelengths different from each other included in a predetermined wavelength band are transmitted;

a plurality of optical amplifiers, installed on said optical transmission line, each having a wavelength-dependent noise figure;

a first multiplexing station having a first signal multiplexing section installed upstream said plurality of optical amplifiers in a signal light propagating direction, and first signal light outputting means for outputting a first signal light component multiplexed at said first signal multiplexing section;

a second multiplexing station having a second signal multiplexing section installed between said plurality of optical amplifiers, and second signal light outputting means for outputting a second signal light component multiplexed at said second signal

multiplexing section; and

a receiving station, installed downstream said plurality of optical amplifiers, for receiving said first signal light component having a first signal wavelength multiplexed at said first signal multiplexing section and said second signal light component having a second signal wavelength multiplexed at said second signal multiplexing section;

wherein said first signal light outputting means outputs said first signal light component having said first signal wavelength set such that said noise figure between said first signal multiplexing section and said receiving station is lower than that of said second signal wavelength.

7. (Original) An optical transmission system according to claim 6, wherein said signal multiplexing section includes an optical ADM.

8. (Original) An optical transmission system according to claim 6, wherein said signal multiplexing section includes a WDM coupler.

9. (Original) An optical transmission system according to claim 6, wherein said optical amplifier is an Er-doped fiber amplifier.

10. (Original) An optical transmission system according to claim 6, further comprising signal wavelength indicating means for indicating a setting of said signal wavelength for said signal light outputting means in each of said plurality of multiplexing stations according to said noise figure.

11. (Original) An optical transmission system comprising:

an optical transmission line through which a plurality of signal light components having wavelengths different from each other included in a predetermined wavelength band are transmitted;

a plurality of optical amplifiers, installed on said optical transmission line, each having a wavelength-dependent noise figure;

a first multiplexing station having a first signal multiplexing section installed upstream said plurality of optical amplifiers in a signal light propagating direction, and first signal light outputting means for outputting a first signal light component multiplexed at said first signal multiplexing section;

a second multiplexing station having a second signal multiplexing section installed upstream said plurality of optical amplifiers but downstream said first signal multiplexing section, and second signal light outputting means for outputting a second signal light component multiplexed at said second signal multiplexing section; and

a receiving station, installed downstream said plurality of optical amplifiers, for receiving said first signal light component having a first signal wavelength multiplexed at said first signal multiplexing section and said second signal light component having a second signal wavelength multiplexed at said second signal multiplexing section;

wherein said first signal light outputting means outputs said first signal light component having said first signal wavelength set such that said noise figure between said first signal multiplexing section and said receiving station is lower than that of said second signal wavelength.

12. (Original) An optical transmission system according to claim 11, wherein said signal multiplexing section includes an optical ADM.

13. (Original) An optical transmission system according to claim 11, wherein said signal multiplexing section includes a WDM coupler.

14. (Original) An optical transmission system according to claim 11, wherein said optical amplifier is an Er-doped fiber amplifier.

15. (Original) An optical transmission system according to claim 11, further comprising signal wavelength indicating means for indicating a setting of said signal wavelength for said signal light outputting means in each of said plurality of multiplexing stations according to said noise figure.

16. (Original) An optical transmission method applied to an optical transmission system comprising:

an optical transmission line through which a plurality of signal light components having wavelengths different from each other included in a predetermined wavelength band are transmitted;

an optical amplifier, installed on said optical transmission line, having a wavelength-dependent noise figure; and

a plurality of signal multiplexing sections installed on said optical transmission line connected to an input end side of said optical amplifier;

wherein, between two of said signal multiplexing sections adjacent each other, a signal light component having a signal wavelength with a noise figure lower than that of the signal wavelength of a signal light component multiplexed at said signal multiplexing section disposed downstream in a signal light propagating direction is selectively assigned as a signal light component multiplexed at said signal multiplexing section disposed upstream.

17. (Previously Presented) An optical transmission method applied to an optical transmission system comprising:

an optical transmission line through which a plurality of signal light components having wavelengths different from each other included in a predetermined wavelength band are transmitted;

a plurality of optical amplifiers, installed on said optical transmission line, each having a wavelength-dependent noise figure;

a first signal multiplexing section, installed upstream said plurality of optical amplifiers in a signal light propagating direction, for guiding a first signal light component into said optical transmission line;

a second signal multiplexing section, installed between said plurality of optical amplifiers, for guiding a second signal light component into said optical transmission line; and

a receiving station, installed downstream said plurality of optical amplifiers, for receiving said first signal light component having a first signal wavelength multiplexed at said first signal multiplexing section and said second signal light component having a

second signal wavelength multiplexed at said second signal multiplexing section;

wherein said first signal light component having said first signal wavelength whose noise figure between said first signal multiplexing section and said receiving station is lower than that of said second signal wavelength is selectively assigned as said signal light component multiplexed at said first signal multiplexing section.

18. (Previously Presented) An optical transmission method applied to an optical transmission system comprising:

an optical transmission line through which a plurality of signal light components having wavelengths different from each other included in a predetermined wavelength band are transmitted;

a plurality of optical amplifiers, installed on said optical transmission line, each having a wavelength-dependent noise figure;

a first signal multiplexing section, installed upstream said plurality of optical amplifiers in a signal light propagating direction, for guiding a first signal light component into said optical transmission line;

a second signal multiplexing section, installed upstream said plurality of optical amplifiers but downstream said first signal multiplexing section, for guiding a second signal light component into said optical transmission line; and

a receiving station, installed downstream said plurality of optical amplifiers, for receiving said first signal light component having a first signal wavelength multiplexed at said first signal multiplexing section and said second signal light component having a second signal wavelength multiplexed at said second signal multiplexing section;

wherein said first signal light component having said first signal wavelength whose noise figure between said first signal multiplexing section and said receiving station is lower than that of said second signal wavelength is selectively assigned as said signal light component multiplexed at said first signal multiplexing section.